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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Paper No. 20040409

Application Number: 10/053,748
Filing Date: January 18, 2002
Appellant(s): BARFORD, LEE A.

Michael Johnson
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed February 17, 2004.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

The rejection of claims 1-5 and 7-15 stand or fall together because appellant's brief does not include a statement that this grouping of claims does not stand or fall together and reasons in support thereof. See 37 CFR 1.192(c)(7).

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

5,922,079 Booth et al. 07-1999

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-7, 10-11, and 32-36 are rejected under 35 U.S.C. 102(b) as being anticipate by Booth et al. (USP 5,922,079).

Regarding claim 1, Booth et al. teach an automated analysis and troubleshooting system is provided that identifies potential problems with the test suite, and also identifies probable modeling errors based on incorrect diagnoses (e.g. Col.5, lines 35-40), the method comprising step of evaluating a diagnostic efficacy of the test suite (e.g. Col.9, lines 14-15) using a probability of one or both of a correct diagnosis and incorrect diagnosis by the test suite (e.g. Col.11, lines 15-18, lines 27-29).

Regarding claim 32, Booth et al. teach a test system that that identifies potential problems with the test suite, and also identifies probable modeling errors based on incorrect diagnoses comprising: a processor (e.g. Col.6, lines 66-67); a memory (e.g. Col.7, lines 52-55); and a computer program stored in the memory and executed by the processor, wherein the computer program

comprises instructions that, when executed by the processor (e.g. Col.6, lines 61-65, Col.7, lines 10-18), implement evaluating the test suite (e.g. Col.9, lines 14-15) using a probability of one or both of a correct diagnosis and incorrect diagnosis to determine the efficacy (e.g. Col.11, lines 15-18, lines 27-29).

Regarding claims 2, 33, Booth et al. teach the evaluation comprises suggesting a test to add to the test suite to adjust an overall test coverage of the test suite (e.g. Col.6, lines 38-45, Col.11, lines 29-35).

Regarding claims 3, 35, Booth et al. teach suggesting a test comprises: creating a simulation database 124 of the test suite; determining a probability of a correct diagnosis (e.g. Col.6, lines 49-54) and a probability of an incorrect diagnosis for the test suite using the database (e.g. Col.9, lines 33-61); and creating a list of suggested tests from the determined probabilities (e.g. Col.10, line 66-Col.11, line 35).

Regarding claim 4, Booth et al. teach each suggested test on the list comprises test coverage (e.g. Col.11, lines 29-31).

Regarding claims 5-7, 10, 36, Booth et al. teach identifying a test to delete from the test suite (e.g. Col.10, line 66-Col.11, line 15), determining a probability of a correct diagnosis for a modified test suite using the database (e.g. Col.11, lines 24-35, lines 67), the modified test suite (e.g. Col.10, lines 66-67) having a selected test removed from the test suite (e.g. Col.11, lines 4-10); computing an efficacy value associated with the selected test using the determined probabilities of a correct diagnosis for the test suite (e.g. Col.5, lines 49-59) and the modified

test suite (e.g. Col.11, lines 25-35); and generating a list of deletable tests and associated efficacy values (e.g. Col.9, lines 38-40, Col.11, lines 15-19).

Regarding claims 11, 34, Booth et al. teach the method of evaluating a diagnostic efficacy of the test suite using a probability of a diagnosis (e.g. Col.11, lines 24-64); creating a simulation database 124 of the test suite (e.g. Col.6, lines 49-54); determining a probability of a correct diagnosis and a probability of an incorrect diagnosis for the test suite using the database (e.g. Col.11, lines 15-18, lines 27-29); using the determined a probability to evaluate the test suite (e.g. Col.9, lines 14-15).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 8, 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Booth et al. (USP 5,922,079) in view of Kanevsky et al. (USP 6,167,352).

Regarding claim 8, Booth et al. fail to teach step of determining a probability for a modified test suite is repeated for a plurality of modified test suites, each modified test suite of the plurality being the test suite having a different selected test removed.

Kanevsky et al. teach step of determining a probability for a modified test suite is repeated for a plurality of modified test suites, each modified test suite of

the plurality being the test suite having a different selected test removed (e.g. Col.9, lines 57).

Regarding claim 32, Kanevsky et al. teach a Monte Carol simulation (e.g. Col.4, lines 40-52, Col.5, lines 18-30).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include step of step of determining a probability for a modified test suite is repeated for a plurality of modified test suites, each modified test suite of the plurality being the test suite having a different selected test removed as taught by Kanevsky et al. in an automated analysis and troubleshooting system for identifying potential problems with the test suite of Booth et al. for purpose of providing an automated tools for selection of one or more next tests to apply to a device under test (Kanevsky et al., Col.1, lines 9-11).

5. Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Booth et al. (USP 5,922,079) in view of Preist et al. (USP 5,808,919).

Regarding claim 38, Booth et al. fail to teach a list of respective tests, the lists being represented in one or both of human readable form or machine readable form.

Preist et al. teach a list of respective tests, the lists being represented in human readable form (e.g. Col.6, lines 30-41).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a list of respective tests, the lists being represented in human readable form as taught by Preist et al. in an automated

analysis and troubleshooting system is provided that identifies potential problems with the test suite of Booth et al. for purpose of providing a diagnostic system for diagnosing the cause of failures of functional tests made on a system under test wherein the system under test comprises a plurality of interacting components and wherein the diagnostic system comprises means for interpreting test results according to a set of operations which are involved in carrying out the tests (Preist et al., Col.1, lines 61-67).

Allowable Subject Matter

6. Claim 9, 12-30 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 9, none of the prior art of record teaches or suggests the combination of a method of determining a revision of a test suite of a model-based diagnostic testing system, wherein the method comprising step of evaluating a diagnostic efficacy of the test suite using a probability of a diagnosis, wherein the evaluation comprises identifying a test to delete from the test suite, the deletable test having a minimal effect on an overall diagnostic efficacy of the test suite, wherein identifying a test comprises step of determining a probability of a correct diagnosis for a modified test suite using the database, wherein the modified test suite is the test suite having a selected test removed; computing an efficacy value for the modified test suite using the determined probabilities; and

generating a list of deletable tests using the computed efficacy values, wherein step of determining a probability for a modified test suite is repeated for a plurality of modified test suites, each modified test suite of the plurality being the test suite having a different selected test removed, wherein the selected test associated with the modified test suite having a low computed efficacy value relative to other modified test suites is the deletable test.

Regarding claim 12, none of the prior art of record teaches or suggests the combination of a method of evaluating a diagnostic efficacy of a test suite of a model based diagnostic testing system, wherein the method comprising step of creating a simulation database of the test suite, wherein creating a simulation database comprises step of simulating an application of the test suite to a device under test, the device under test comprising one or more components; and recording a probable result of the application in the simulation database, the simulation database being represented by a table having a plurality of columns and a plurality of rows, the plurality of columns comprising a component pattern, a test result pattern, and a number of occurrences, wherein the component pattern encodes which component is good or bad, each component of the device under test being represented by a unique position number within the component pattern, wherein the test result pattern encodes which of the tests of the test suite failed or passed, each test in the test suite being represented by a unique position within the test result pattern, wherein the number of occurrences represents a number of times that a given combination of the component pattern and the test result pattern occurred during a simulation, the number of

occurrences being an integer greater than or equal to zero, and wherein each row of the plurality of rows corresponds to a different unique pattern of good and bad components.

(11) Response to Argument

The rejection of claim 1

In response to Appellants' argument that "Booth et al. do not contain any teaching or suggestion evaluating a diagnostic efficacy of the test suite using a probability of one or both of a correct diagnosis and incorrect diagnosis by the test suite" (Appeal Brief, page 8, paragraph 5), the examiner disagrees. Booth et al. teach the test system 100, the model based diagnostic system 106, test suite analysis 116 and model debug 120 are all typically computer or processor based. That is, software is executed by a processor within an automated test system or the test system is controlled by a separate computer. In general, the test suite analysis 116 and model debug 120 can be performed by a processor or computer used for the test system 100 or used for the model based diagnostic system 106. Alternatively, test suite analysis and model debug may be performed offline on a separate system or distributed among several systems. Note also that some of the statistical inferences involved may be determined by fuzzy logic or neural networks so that the word "automated" is not restricted to sequential execution of computer instructions (Fig.1, Col.6, line 60-Col.7, line 7). The test suite may be evaluated for overall accuracy by analysis of historical data (FIG. 1, 126). For example, the system could compute the mutual information (or other statistical or information theoretic measures) between the model-based

diagnosis and the distribution of TFC's recorded in the database (Col.9, lines 14-19). Booth et al. disclose a method of identifying improvements to a test suite in diagnosability analysis, the test suite based on a model of a system, the method comprising automatically identifying components, the failure of which has a probability of detectability by the test suite (Col.8, lines 15-31, Col.13, lines 59-65). The debug of the model based on incorrect diagnoses (Col.9, lines 33-34). Historical data may be used in conjunction with the model-based diagnostic system: providing cases for performance evaluation of the model-based system; allowing evaluation of the effect of changes suggested by debugging on overall performance (Col.11, lines 50-60). This feature is seen to be an inherent teaching evaluating a diagnostic efficacy of the test suite using a probability of one or both of a correct diagnosis and incorrect diagnosis by the test suite as intended.

The rejection of claim 2

In response to Appellants' argument that "Booth et al. do not contain any teaching or suggestion evaluating a diagnostic efficacy of the test suite using a probability of one or both of a correct diagnosis and incorrect diagnosis by the test suite" (Appeal Brief, page 10, paragraph 4), the examiner disagrees. Booth et al. teach an automated analysis and troubleshooting system is provided that identifies potential problems with the test suite (ability of the model to detect and discriminate among potential faults), and also identifies probable modeling errors based on incorrect diagnoses (Col.5, lines 36-40). Booth et al. teach step of evaluating a diagnostic efficacy of the test suite (e.g. Col.9, lines 14-15) using a

probability of one or both of a correct diagnosis and incorrect diagnosis (failure probability term) by the test suite (e.g. a probability of detectability by the test suite, Col.11, lines 15-18, lines 24-29, Col.13, line 64).

The rejection of claim 3

In response to Appellants' argument that "Booth et al. do not contain any teaching or suggestion determining a probability of a correct diagnosis and a probability of an incorrect diagnosis for the test suite using the database; and creating a list of suggested tests from the determined probabilities" (Appeal Brief, page 11, paragraph 5), the examiner agrees.

The rejection of claim 4

In response to Appellants' argument that "Booth et al. do not contain any teaching or suggestion determining a probability of a correct diagnosis and a probability of an incorrect diagnosis for the test suite using the database; and creating a list of suggested tests from the determined probabilities" (Appeal Brief, page 12, paragraph 3), the examiner agrees.

The rejection of claim 5

In response to Appellants' argument that "Booth et al. do not contain any teaching or suggestion determining a probability of a correct diagnosis for a modified test suite using the database, the modified test suite having a selected test removed from the test suite; computing an efficacy value associated with the selected test using the determined probabilities of a correct diagnosis for the test suite and the modified test suite; and generating a list of deletable tests and

associated efficacy values" (Appeal Brief, page 10, paragraph 4), the examiner agrees.

The rejection of claim 6

In response to Appellants' argument that "Booth et al. do not contain any teaching or suggestion evaluating a diagnostic efficacy of the test suite using a probability of one or both of a correct diagnosis and incorrect diagnosis by the test suite; and identifying a test to delete from the test suite, the deletable test having a minimal effect on an overall diagnostic efficacy of the test suite" (Appeal Brief, page 13, paragraph 2), the examiner disagrees. Booth et al. teach evaluating a diagnostic efficacy of the test suite (e.g. Col.9, lines 14-15) using a probability of one or both of a correct diagnosis and incorrect diagnosis (failure probability term) by the test suite (e.g. a probability of detectability by the test suite, Col.11, lines 15-18, lines 24-29, Col.13, line 64); and identifying a test to delete from the test suite, the deletable test having a minimal effect on an overall diagnostic efficacy of the test suite (e.g., if an incorrect diagnosis is made, the automated analysis system identifies ways of changing the rank order of diagnoses, including coverages that can be reduced and identification of operation violations that can be eliminated, Abstract).

The rejection of claim 7

In response to Appellants' argument that "Booth et al. do not contain any teaching or suggestion determining a probability of a correct diagnosis for the test suite using the database; determining a probability of a correct diagnosis for a modified test suite using the database, wherein the modified test suite is the

test suite having a selected test removed; computing an efficacy value for the modified test suite using the determined probabilities; and generating a list of deletable tests using the computed efficacy values." (Appeal Brief, page 13, paragraph 3), the examiner agrees.

The rejection of claim 8

In response to Appellants' argument that "Booth et al. do not contain any teaching or suggestion determining a probability for a modified test suite is repeated for a plurality of modified test suites, each modified test suite of the plurality being the test suite having a different selected test removed" (Appeal Brief, page 24, paragraph 3), the examiner agrees.

The rejection of claim 10

In response to Appellants' argument that "Booth et al. do not contain any teaching or suggestion suggesting a test to add to the test suite to adjust an overall test coverage of the test suite that comprises: determining a probability of an incorrect diagnosis for the test suite using the database; and creating a list of tests to add from the determined correct and incorrect probabilities for the test suite" (Appeal Brief, page 13, paragraph 4), the examiner agrees.

The rejection of claim 11

In response to Appellants' argument that "Booth et al. do not contain any teaching or suggestion creating a simulation database of test suite; determining a probability of one or both of a correct diagnosis and incorrect diagnosis for the test suite using database" (Appeal Brief, page 14, paragraph 6), the examiner disagrees. Booth et al. teach the test suite analysis 116 and model debug

analysis 120 can be used with simulated data 124 (Col.6, lines 52-54). Either simulated data (FIG. 1, 124) or historical TFC data (FIG. 1, 126) may be used for such analysis. If failure distribution information is available, the simulated failures may be created accordingly (Col.9, lines 4-8). Although Booth et al. do not specifically disclose the claimed creating a simulation database of test suite, this feature is seen to be an inherent teaching of that step since the test suite analysis 116 can be used with simulated data 124 (Col.6, lines 52-54). Booth et al. disclose the simulated data (FIG. 1, 124) may be used for such analysis. If failure distribution information is available, the simulated failures may be created accordingly (Col.9, lines 4-8) that some type of creating a simulation database of test suite must be present for determining probability of one or both a correct diagnosis and an incorrect diagnosis for the test suite as intended. Booth et al. teach step of determining a probability of one or both a correct diagnosis and an incorrect diagnosis for the test suite using the database (e.g. Col.11, lines 15-18, lines 27-29); using the determined a probability to evaluate the test suite (e.g. Col.9, lines 14-15).

The rejection of claim 31

In response to Appellants' argument that "Booth et al. do not contain any teaching or suggestion the created simulation database comprises a Monte Carol simulation of the device under test model, the database having a set of entries, each entry having a field for a number-of-occurrences value, a field for a test result pattern, and a field for a component state pattern." (Appeal Brief, page 28, paragraph 2), the examiner agrees.

The rejection of claim 32

In response to Appellants' argument that "Booth et al. do not contain any teaching or suggestion a computer program stored in the memory and executed by the processor, wherein the computer program comprises instructions that, when executed by the processor, implement evaluating the test suite using a probability of one or both a correct diagnosis and an incorrect diagnosis by the test suite to determine the efficacy." (Appeal Brief, page 27, paragraph 3), the examiner disagrees. Booth et al. teach the test system 100, the model based diagnostic system 106, test suite analysis 116 and model debug 120 are all typically computer or processor based. That is, software is executed by a processor within an automated test system or the test system is controlled by a separate computer. In general, the test suite analysis 116 and model debug 120 can be performed by a processor or computer used for the test system 100 or used for the model based diagnostic system 106. Alternatively, test suite analysis and model debug may be performed offline on a separate system or distributed among several systems. Note also that some of the statistical inferences involved may be determined by fuzzy logic or neural networks so that the word "automated" is not restricted to sequential execution of computer instructions (Fig.1, Col.6, line 60-Col.7, line 7). The test suite may be evaluated for overall accuracy by analysis of historical data (FIG. 1, 126). For example, the system could compute the mutual information (or other statistical or information theoretic measures) between the model-based diagnosis and the distribution of TFC's recorded in the database (Col.9, lines 14-19). Booth et al. disclose a

method of identifying improvements to a test suite in diagnosability analysis, the test suite based on a model of a system, the method comprising automatically identifying components, the failure of which has a probability of detectability by the test suite (Col.8, lines 15-31, Col.13, lines 59-65). The debug of the model based on incorrect diagnoses (Col.9, lines 33-34). Historical data may be used in conjunction with the model-based diagnostic system: providing cases for performance evaluation of the model-based system; allowing evaluation of the effect of changes suggested by debugging on overall performance (Col.11, lines 50-60). This feature is seen to be an inherent teaching a computer program stored in the memory and executed by the processor, wherein the computer program comprises instructions that, when executed by the processor, implement evaluating the test suite using a probability of incorrect diagnosis by the test suite to determine the efficacy as intended.

The rejection of claim 33

In response to Appellants' argument that "Booth et al. do not contain any teaching or suggestion the instructions that evaluate the test suite comprise one or both of suggesting a test to add to the test suite, and identifying a test to delete from the test suite" (Appeal Brief, page 8, paragraph 2), the examiner disagrees. Booth et al. disclose an automated analysis system that identifies detectability problems, diagnosability problems, and possible ways to change rank order of diagnoses in a diagnostic system and makes the problems and possible improvements visible to test programmers to aid in test improvement. Components that have no coverage and components that have inadequate

coverage (according to a heuristic criteria) are identified as potential detectability problems. Components that are exercised by identical operations in all tests are identified as diagnosability problems. If an incorrect diagnosis is made, the automated analysis system identifies failing tests that have no coverage of any component in the true failure cause. In addition, if an incorrect diagnosis is made, the automated analysis system identifies ways of changing the rank order of diagnoses, including coverages that can be reduced and identification of operation violations that can be eliminated or deliberately added (Abstract). This feature is seen to be an inherent teaching the instructions that evaluate the test suite comprise one or both of suggesting a test to add to the test suite, and identifying a test to delete from the test suite as intended.

The rejection of claim 34

In response to Appellants' argument that "Booth et al. do not contain any teaching or suggestion creating a simulation database of the test suite; determining a probability of one or both of a correct diagnosis and an incorrect diagnosis using the database; and using the determined probability to evaluate the test suite." (Appeal Brief, page 17, paragraph 4, page 18, paragraphs 3-4), the examiner disagrees. Booth et al. teach the test suite analysis 116 and model debug analysis 120 can be used with simulated data 124 (Col.6, lines 52-54). Either simulated data (FIG. 1, 124) or historical TFC data (FIG. 1, 126) may be used for such analysis. If failure distribution information is available, the simulated failures may be created accordingly (Col.9, lines 4-8). Although Booth et al. do not specifically disclose the claimed creating a simulation database of

test suite, this feature is seen to be an inherent teaching of that step since the test suite analysis 116 can be used with simulated data 124 (Col.6, lines 52-54). Booth et al. disclose the simulated data (FIG. 1, 124) may be used for such analysis. If failure distribution information is available, the simulated failures may be created accordingly (Col.9, lines 4-8) that some type of creating a simulation database of test suite must be present for determining probability of one or both a correct diagnosis and an incorrect diagnosis for the test suite as intended. Booth et al. teach step of determining a probability of one or both a correct diagnosis and an incorrect diagnosis for the test suite using the database (e.g. Col.11, lines 15-18, lines 27-29); using the determined a probability to evaluate the test suite (e.g. Col.9, lines 14-15).

The rejection of claim 35

In response to Appellants' argument that "Booth et al. do not contain any teaching or suggestion using the determined probability of both a correct diagnosis and an incorrect diagnosis comprises creating a list of suggested tests to add to the test suite, each suggested test having an associated test coverage" (Appeal Brief, page 8, paragraph 2), the examiner agrees.

The rejection of claim 36

In response to Appellants' argument that "Booth et al. do not contain any teaching or suggestion the instructions that evaluate the test suite further comprise: determining a probability of a correct diagnosis for a modified test suite using the database, the modified test suite having a selected test removed from the test suite; and wherein using the determined probability comprises:

computing an efficacy value for the modified test suite using the determined probability of a correct diagnosis for both the test suite and the modified test suite; and generating a list of tests to delete from the test suite based on the computed efficacy value" (Appeal Brief, page 8, paragraph 2), the examiner agrees.

The rejection of claim 37

In response to Appellants' argument that "Booth et al. do not contain any teaching or suggestion determining a probability of a correct diagnosis for a modified test suite is repeated for different modified test suites, each different modified test suite having an associated different selected test being removed" (Appeal Brief, page 8, paragraph 2), the examiner agrees.

For the above reasons, it is believed that the rejections should be sustained.

An appeal conference was held on 03/30/2004 with Olik Chaudhuri, SPE of AU 2823, and John E. Barlow, SPE of AU 2863.

Respectfully Submitted,

John H. Le

April12, 2004

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